

REMARKS/ARGUMENTS

Claims 1-7, 11-16, 33-44, and 60 remain pending after entry of the subject amendment. All prior claims were rejected as allegedly being unpatentable over the cited art. Claims 11, 13 and 33 have been amended. Claim 60 has been added new. Re-examination and reconsideration of the amended claims are respectfully requested.

Information Disclosure Statement

Applicants are resubmitting an Information Disclosure Statement concurrently with the subject amendment. Copies of the references are being included with that Information Disclosure Statement, and the Applicants respectfully request that the disclosures be acknowledged in the next communication from the Patent Office regarding the subject application.

Claim Objections

Claims 11-13 were objected to because of various informalities. Claims 11 and 13 have been amended to provide appropriate antecedent basis, and Applicants request that the objections to the claims be removed.

Objections to the Specification

Applicants have added a brief description of Fig. 3A, with the wording being taken (with only minor variations) from the preceding description of Fig. 3. Removal of the objection to the specification is respectfully requested.

Claim Rejections Under 35 U.S.C. §102

Claims 1-6 and 13 were rejected under 35 U.S.C. §102(b) as allegedly being anticipated by U.S. Patent No. 5,280,312 in the name of Yamada et al. Such rejections are traversed in part and overcome in part as follows.

Independent claim 1 recites a method for determining whether an image of an eye is of a left eye or a right eye. The method of claim 1 comprises locating an iris center, locating a corneal vertex, and determining whether it is a left eye or a right eye based on the location of the corneal vertex relative to the iris center.

As described generally throughout the originally-filed specification for the subject application, the vertex or apex of the cornea is typically displaced somewhat from the center of the pupil of the eye, with the orientation of the displacement often depending on whether the eye is a right eye or a left eye. When viewing the eye from the optical axis, the vertex may be displaced slightly towards the nose relative to the pupil. This slight offset may be used to great advantage when performing procedures on the eye such as laser eye surgery. While the doctor is concentrating on the eye structure (often under significant magnification), there is some risk that the patient may have a therapy that was intended to be applied to the right eye, but is inadvertently instead applied to the left eye. Hence, the invention can provide an automated system which can identify an eye of a patient, even while the eye of the patient remains aligned with the treatment system. The vertex may conveniently be identified using lateral displacement of reflections from appropriately positioned light sources.

Applicants respectfully submit that the advantageous methods now being claimed are not reasonably rendered obvious by the cited references, and that elements of the claimed inventions are entirely absent from the cited references regardless of whether they are taken alone or in any reasonable combination. In particular, none of the references reasonably teaches the determination of whether an eye image is from a left eye or a right eye based on a location of the corneal vertex relative to an iris center as recited by claim 1, employing an assumption that a reflection is displaced toward a nose as recited by claim 4, or that the determination is only made if the displacement is equal to or greater than a predetermined threshold as recited in claim 6.

Regarding the actual disclosure of the Yamada et al. reference, as Applicants understand that document it is intended to identify a visual axis of an eye looking into a camera so as to appropriately set a light meter for a captured image. While the disclosure is not entirely clear, the only disclosure in the Yamada reference which Applicants can identify as even remotely relating to determination of whether a right eye or left eye is looking into the camera

occurs at the bottom of column 5 and in the paragraph bridging columns 7 and 8, and this disclosure expressly indicates that the determination of which eye is being used to look into the viewfinder is based on a "distribution of the calculated rotation angle of the optical axis of the eyeball." [Yamada et al. '312, col. 7, lines 64-66]. Nonetheless, to clarify that the disclosure of the reference *does not* actually disclose, teach, or even remotely suggest the currently claimed determination between a left eye and a right eye based on relative locations of the corneal vertex and iris center, Applicants set forth the cited portions of the reference in context:

The MPU 8 has a circuit for detecting the optical axis of the eyeball, an eyeball discriminating circuit for discriminating between the right eye and the left eye, a visual axis correcting circuit for correcting any irregularity by the size of the eyeball, a watching point detecting circuit, etc., and performs various calculation processes by the use of the aforementioned data. [Yamada et al. '312, col. 5, lines 62-68]

...

Further, in the eyeball discrimination circuit included in the signal processing circuit 109, whether the eye of the observer looking into the finder optical system is the right eye or the left eye is discriminated, for example, from the distribution of the calculated rotation angle of the optical axis of the eyeball (#12), and further in the visual axis correction circuit, correction of the visual axis is effected on the basis of the eyeball discrimination information and the rotation angle of the optical axis of the eyeball (#13) and also, in the watching point detection circuit, the watching point is calculated on the basis of the optical constant of the finder optical system (#14). [Yamada et al. '312, col. 7, line 61 to Col. 8, line 5]

Once again, it is not entirely clear how Yamada et al. intends to discriminate between a left eye and right eye; nonetheless the proposed use of a "distribution of the calculated rotation angle of the optical axis of the eyeball" is entirely different that the currently-claimed relative locations of the corneal vertex and iris center. In fact, the relative locations of the corneal vertex and iris center will be most readily identifiable from an image taken directly along

the optical axis (as in the exemplary embodiments described in paragraph 45 on page 13 of the originally-filed specification for the subject application). In contrast, the Yamada et al. reference instead seeks to identify the location of the optical axis as the eye views and scans throughout a range of viewing angles, and apparently relies on the distribution of those differing viewing angles. Hence, the two techniques do not appear to be easily compatible, and the Yamada et al. viewing axis identification technique certainly fails to teach or suggest the currently claimed methods.

Regarding claim 4, that claim recites that the determination of method claim 1 makes use of an assumption that a reflection is displaced relative to the iris center toward a nose of a patient. As Applicants understand the methodology of Yamada et al., that reference relies on movement of Perkinje images in whatever direction the eye is viewing to identify the optical axis of the eye. Once again, there is no suggestion in Yamada et al. that the Perkinje images used in that technique will somehow shift toward the nose of the patient, as there is no suggestion in Yamada et al. that the optical vertex or apex is offset (when viewing the eye along its optical axis) relative to the iris center.

Applicants note that the Examiner has cited column 6, line 21 - column 7, line 60 of Yamada et al. regarding claim 4. Applicants respectfully submit that the cited portion of the reference fails totally to present any disclosure regarding an assumption that light reflected from the eye will shift toward the nose of the patient, so that the cited disclosure does not properly disclose anticipation or obviousness of the claimed invention.

Regarding claim 6, that claim recites that the left/right determination is made only if the displacement of at least one reflection towards the nose is greater than a predetermined threshold. The Office Action cites the same portion of Yamada et al. as referenced in the rejection of claim 4 (Col. 6, line 21-Col. 7, line 60). The cited portion of the reference, unfortunately, does not disclose *any* displacement of reflections toward a nose, nor that the displacement be above a certain threshold to provide an accurate determination. Absent any explained rationale for the modification of the reference to include the elements clearly recited in the claims, neither anticipation nor obviousness have been established.

Rejections Under 35 U.S.C. §103

Claims 7, 11, and 12 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Yamada et al. in view of U.S. Patent No. 6,685,320 in the name of Hirohara et al. Claims 14-16 were rejected under §103 as allegedly being unpatentable over Yamada in view of U.S. Patent No. 5,822,446 in the name of Kato. Claims 33-44 were rejected under §103(a) as allegedly being unpatentable Yamada in view of Kato, and further in view of Hirohara. Applicants respectfully submit that the Hirohara et al. and Kato references fail to overcome the shortcomings of the Yamada reference described above regarding claim 1. For example, the following disclosure of the Hirohara et al. reference is cited as allegedly teaching one or more elements of the currently claimed inventions:

In this drawing, the anterior eye part and the Hartmann image form a pair, and three pairs of images are displayed on one screen. In the respective screens, in the case of data for measuring the optical characteristics, [ANALYZE] is clicked, and in the case where it is desired to exclude them from measurement objects, [DELETE] is clicked to select an image. In the case where they are not selected, the pressing of [DELETE] can be omitted. Alternatively, in the case where they are selected, the pressing of [ANALYZE] may be omitted. When the selection of the displayed screen is completed, an arrow key at the lower left part is clicked to move the screen to a next screen or a former screen, and this is repeated until necessary selections are completed. [OD] denotes a right eye, and [OS] denotes a left eye. When [OD] is pressed, only images concerning the right eye are displayed, and when [OS] is pressed, only images concerning the left eye are displayed. When all selections are ended, [CONTINUE] is clicked, and analysis of the optical characteristics is started on the basis of the selected data. The analysis of the optical characteristics concerning the image may be performed when [ANALYZE] is clicked. Incidentally, for example, when a measurement is made at the same time as a refract meter, that is, in the case where refractive power of the subject eye, an astigmatism degree, and an astigmatism axis angle are known, those indications

may be added to the center portion. In the case where these values are measured each time the Hartmann image is captured, by their dispersion, they can be made the basis of judgment as to whether selection is made. The analysis of the optical characteristics is not carried out, but only the acquired image may be stored. At this time, the analysis can be carried out later. [Hirohara et al. '320, Col. 10, lines 11-42].

Note that the determination of whether a left eye or right eye is to be treated in the Hirohara method relies entirely on an input from a doctor, specifically in the form of pushing either a right eye button or left eye button. When the left eye button is pushed, only images of the left eye are displayed. There is no comparison or discrimination based on any feature of the eye, no indication that any ability to discriminate between the features of the eye would be beneficial for the Hirohara et al. therapy, and no recognition that there is any danger whatsoever in relying on the doctor's identification of the eye. Hence, Hirohara et al. teaches directly away from the methods of the present invention, and supports patentability of the subject claims.

Similarly, the Office Action cites from the Kato reference the disclosure found in Col. 8, lines 41-53 and Col. 10, lines 4-17. The disclosure actually found in the cited references is completely inapposite regarding any basis for evaluating whether an image of an eye is from a right eye or a left eye, and completely fails to describe or suggest that any differential location between the corneal vertex and the iris center could be used to make such a determination. Furthermore, neither the Hirohara nor Kato references even remotely disclose or suggest any displacement of a reflection from the eye toward a nose of a patient, nor the use of a threshold in making the currently claimed determination, so that claims 4 and 6 are also allowable for the reasons given above.

Regarding independent claim 33, that claim recites determining whether an image is of a left eye or a right eye, based on nasally-directed displacement of a corneal vertex. Hence, claim 33 is allowable for many of the reasons given above regarding claim 4.

Regarding claim 38, that claim recites comparing a measured displacement with a predetermined threshold displacement, so that claim 38 is allowable for many of the reasons

given above regarding claim 6. The various other dependent claims are allowable as depending from allowable base claims, as well as for the novel combinations of elements recited therein.

The Added Claim

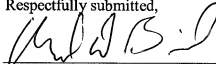
Applicants have added claim 60 to recite that the eye is aligned in the image by focusing the eye on a fixation target. This fixation of the eye is directly contrary to the method described Yamada et al, which apparently relies on some analysis of the "distribution of the calculated rotation angle of the optical axis." Hence, claim 60 is allowable as depending from an allowable base claim, as well as for the elements recited therein.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



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